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Preliminary isoseismal map and intensity distribution for the
Southeastern Illinois earthquake of June 10, 1987

by

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This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature

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INTRODUCTION

The June 10, 1987 earthquake that occurred in Southeastern Illinois was felt in all or parts of sixteen states: Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, Ohio, Pennsylvania, South Carolina, Tennessee, West Virginia, and Wisconsin. It was also reported "felt" in the southern part of the Canadian Province of Ontario. The only reported injury was to a small child at Lawrenceville, Illinois.

The Preliminary Determination of Epicenters (PDE) No. 23-87 (June 25, 1987) gives the following parameters for the June 10, 1987 main shock:

Origin Time: 23:48:54 UTC (6:48 PM CDT)
Latitude: 38.713N
Longitude: 87.954W
Depth: 10km
Magnitude: 4.9mb(GS), 4.4Ms(GS), 5.1Mn(SLM)

The above location places the epicenter about 12 km east of Olney, Illinois.

This brief report summarizes the intensity V and VI effects and presents a generalized isoseismal map (Figure 1) for the June 10, 1987 Southeastern Illinois earthquake. A preliminary estimate of the maximum Modified Mercalli intensity (MMI) of VI is assigned to this earthquake. It should be emphasized that the assignment of intensities is preliminary and is subject to change as more information becomes available.

INTENSITY DISTRIBUTION

Only minor damage resulted from the earthquake even though it was felt over a large area of the United States. Damage to structures was mostly architectural. All intensities were rated using the Modified Mercalli Intensity Scale of 1931 (Wood and Neumann, 1931). A composite list of the reported effects that characterize localities enclosed by the V and VI isoseismals (Figure 1) include:

- (a) Slight damage to earthen/concrete dams (hairline cracks).
- (b) Isolated instances of chimney damage that appear to be related to older chimneys in varying states of disrepair (cracks, broken at roofline, fallen).
- (c) Open cracks in brick/stone fences or walls.
- (d) Large cracks in highways/streets/sidewalks.
- (e) Cracked elevated water tank.
- (f) Cracked cement and cinderblock foundations (slight).
- (g) Slight damage to concrete bridges/overpasses (hairline cracks).
- (h) Cracks in exterior brick walls.
- (i) Hairline cracks in plaster, stucco, and drywall interior walls.
- (j) Overturned heavy/light furniture or appliances.
- (k) Few windows cracked.
- (l) Many small objects overturned/fallen.
- (m) Many hanging pictures fell.
- (n) Few items thrown from store shelves.
- (o) Bubbles formed on top of ponds.
- (p) Muddied springs/wellwater.
- (q) Underground pipes out of service.
- (r) Railroad tracks bent slightly.

Although marginal and isolated instances of intensity VII effects were reported from several localities, this earthquake is best described, in

terms of intensity, as an earthquake with maximum intensity near the upper limit of intensity VI.

ISOSEISMAL MAP

Figure 1 shows the areal distribution of intensity in the United States. The isoseismal map was compiled from data obtained through a USGS questionnaire canvass of postmaster and selected government field agencies located within a radius of 900 km of the epicenter. Approximately 4800 questionnaire cards were evaluated for "felt" and "not felt" data.

The isoseismal II - IV is drawn to enclose all contiguous localities that felt the earthquake. The contiguous felt area is estimated at 433,000 sq km in the United States.

The V isoseismal outlines an elongated region of intensities V and VI. This region, oriented in a southwest - northeast direction, stretches from south of Lawrenceville in southeastern Illinois to the central part of Indiana near Huntington. There is an apparent northwest extension of the V isoseismal into parts of Edgar and Vermilion Counties in Illinois from approximately Terre Haute in Vigo County Indiana. There are two prominent areas of low intensity (IV) that are located within the V isoseismal: one area is located west of the epicenter, and the other area (a narrow trough) is located northeast of the epicenter in central Indiana.

There are scattered pockets of anomalous intensity V areas that outline a minimum of four communities within the contiguous felt area. In Illinois there are four areas: one area is located on the Mississippi River (near St. Louis, MO); the other three areas exhibit a northwest trend through the central part of the state. In Indiana there are five areas: two areas are located along the Ohio River; one area is located at the tip of Lake Michigan; the fourth and fifth areas are located in the southeastern and northwestern quadrants of the state. One other anomalous intensity V area occurs in the vicinity of Bellefontaine, Ohio.

Five regions are located near the periphery of the contiguous felt area which provided scant information or returned several cards indicating "not felt". The areas are designated as "NF" in Figure 1 and they are located in northeast and southeast Missouri, southeastern Wisconsin, southern part of Michigan, and in northeastern Kentucky. These five regions and the part of Lake Michigan that is enclosed within the contiguous felt area are not included in the calculation of the estimated felt area.

The outer limit of the II - IV isoseismal was not extended to include isolated intensities or clusters of intensities because of the "not felt" reports that separated these localities from the contiguous felt area. These localities are shown in Figure 1 as arabic numerals that represent the assigned intensity. Many of the outlying localities represent reports from persons located in upper stories of high-rise buildings, or they were located in other "favorable environments" to detect the earthquake vibration.

Isoseismals are drawn to represent the general consensus of the data; they do not define individual values.

REFERENCES CITED

Wood, H. O., and Neumann, Frank, 1931, Modified Mercalli Intensity Scale of 1931: Seismological Society of America Bulletin, v. 21, no. 4, p. 277-283.

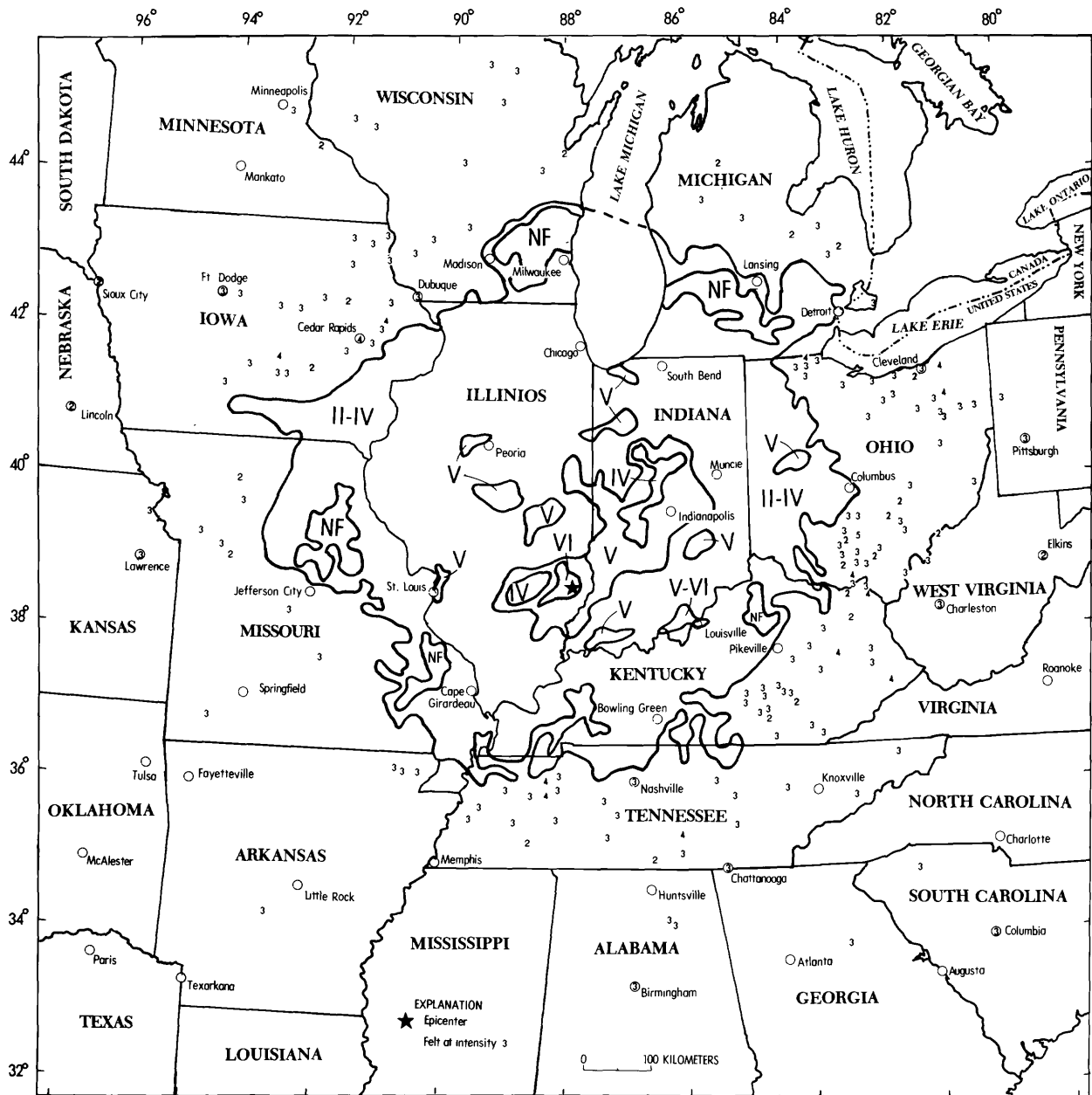


Figure 1.—Isoseismal map for Southeastern Illinois earthquake of June 10, 1987. Roman numerals represent Modified Mercalli intensities between isoseismals.